PDNO.: 200311220-1
Inventor(s): Gary L. Vondran, Jr. et. al.
Title: "Methods and Systems for Processing Print Jobs"
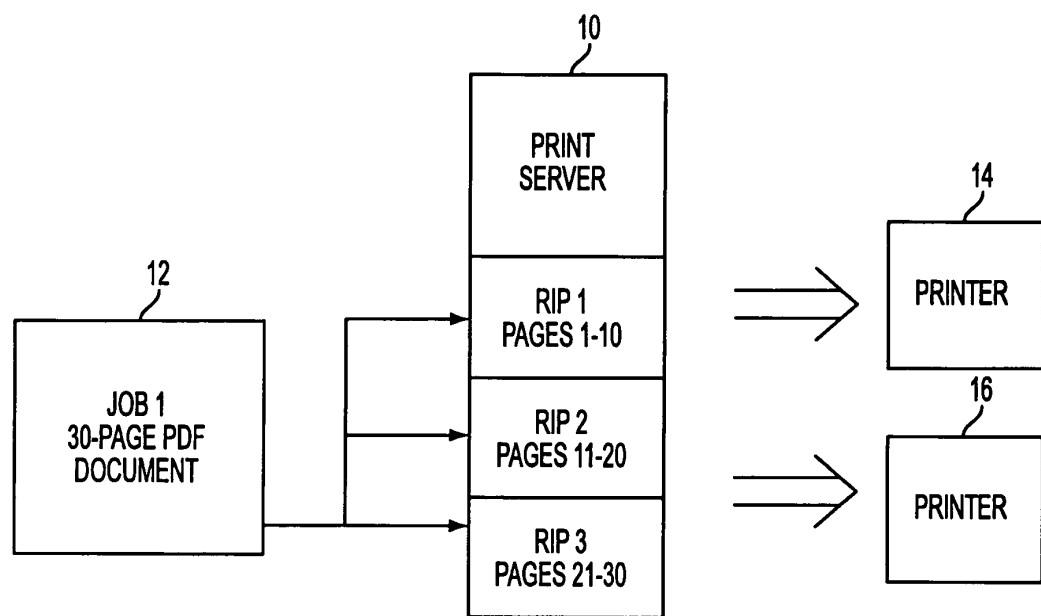Atty: Susan E. Heminger (650)236-2738

1/11

FIG. 1
PRIOR ART

PDNO.: 200311220-1
Inventor(s): Gary L. Vondran, Jr. et. al.
Title: "Methods and Systems for Processing Print Jobs"
Atty: Susan E. Heminger (650)236-2738

2/11

FIG. 2

PDNO.: 200311220-1
Inventor(s): Gary L. Vondran, Jr. et. al.
Title: "Methods and Systems for Processing Print Jobs"
Atty: Susan E. Heminger (650)236-2738

3/11

30

PRINT JOB

31

SPOOLER

32

SYSTEM
CONTROLLER

34

RIP
PRE-PROCESSING

36

OBJECT
TABLE

38

SCHEDULER

39

RIP 1

39

RIP 2

• • • • •

39

RIP n

FIG. 3

PDNO.: 200311220-1
Inventor(s): Gary L. Vondran, Jr. et. al.
Title: "Methods and Systems for Processing Print Jobs"
Atty: Susan E. Heminger (650)236-2738
4/11

START

SELECT AN
OBJECT — 400

OBJECT
HAS A
MATCH? — 402

NO →

YES ↓

INCREMENT
NUMBER OF
USAGES — 404

MORE
OBJECTS? — 406

YES

NO

END

FIG. 4A

PDNO.: 200311220-1
Inventor(s): Gary L. Vondran, Jr. et. al.
Title: "Methods and Systems for Processing Print Jobs"
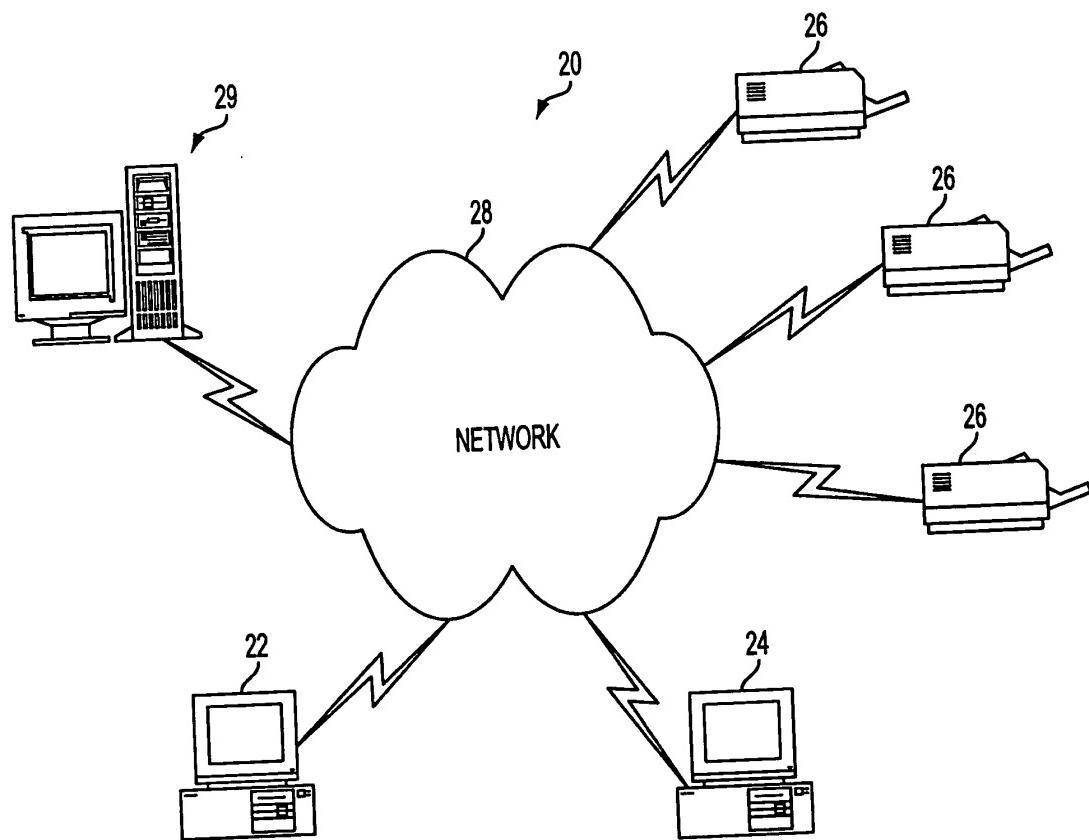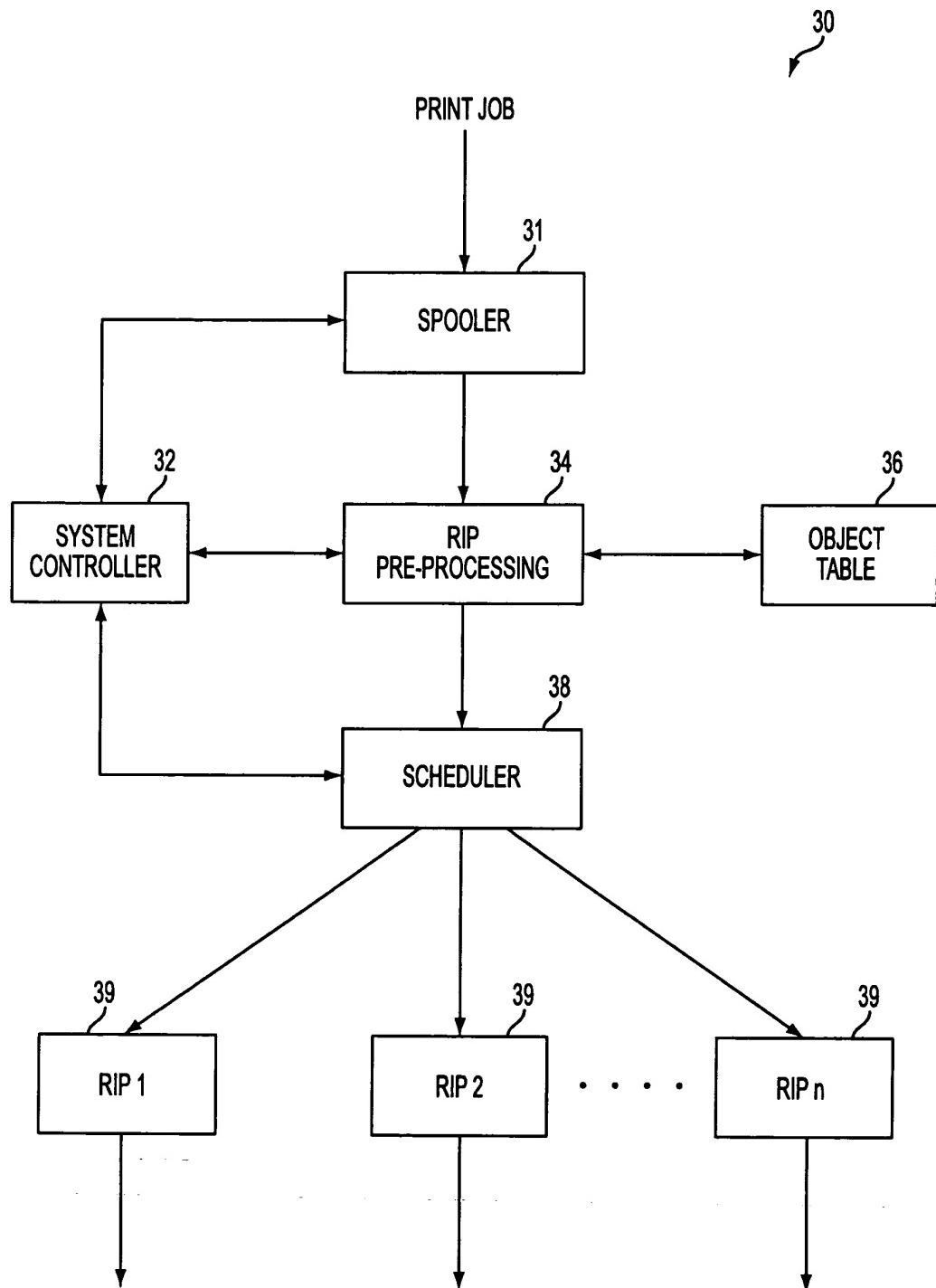Atty: Susan E. Heminger (650)236-2738
5/11

START

SELECT NEXT
OBJECT 40

TRANSFORM
OBJECT 42

GENERATE
OBJECT
SIGNATURE 44

HASH SIGNATURE
INTO OBJECT
TABLE 46

UPGRADE
USAGE
PROFILE 49

SIGNATURE
MATCH
? 48

YES

UPDATE REF.
TO MATCHING
OBJECT 50

NO

INSERT CURRENT
OBJECT INTO
OBJECT TABLE 52

MORE
OBJECTS
? 51

YES

NO

END
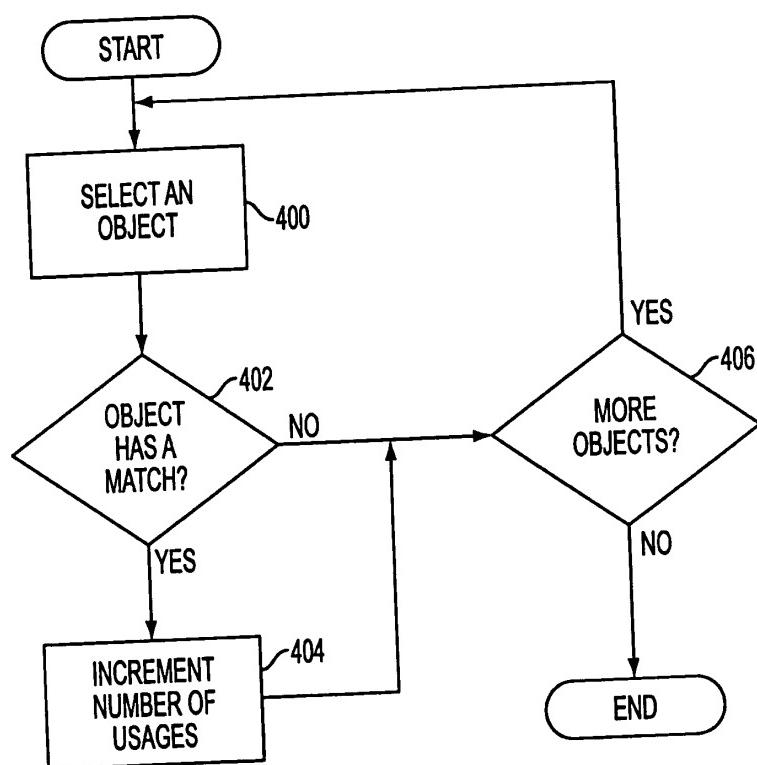
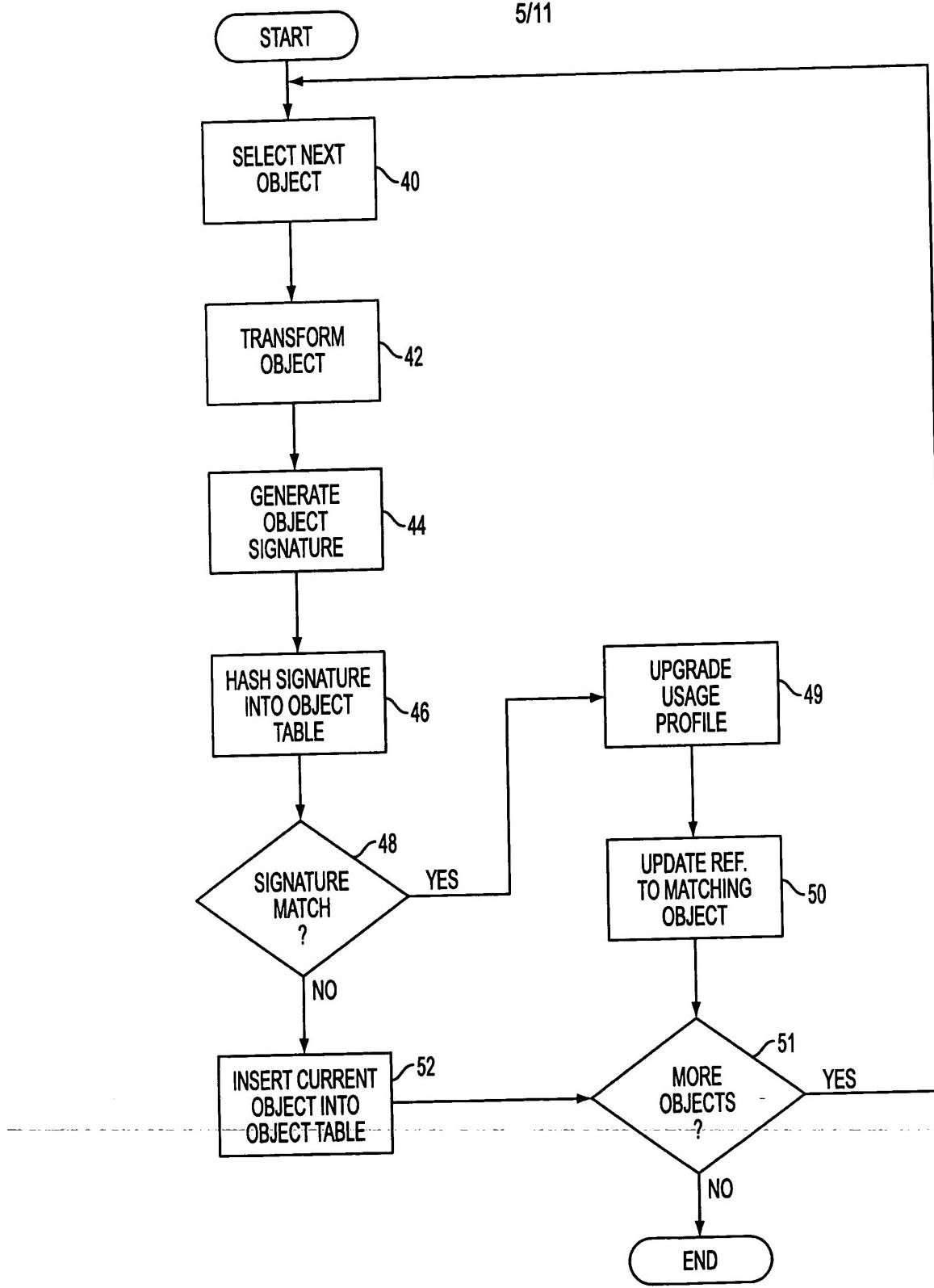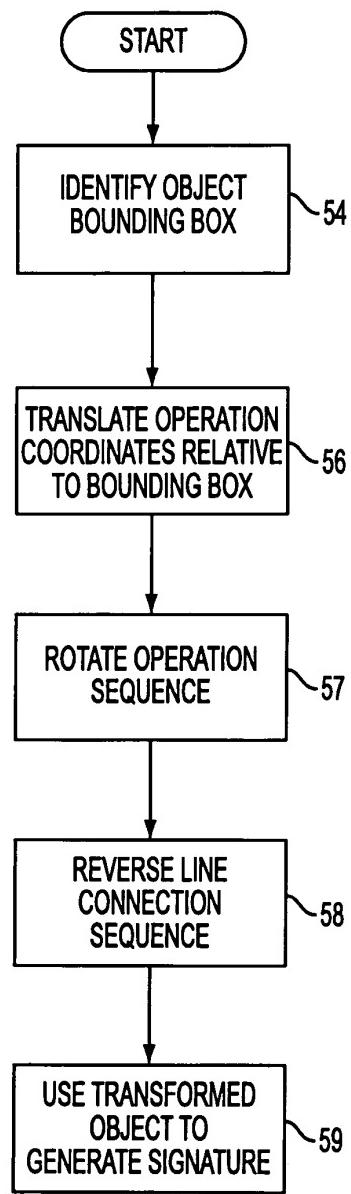FIG. 4B

PDNO.: 200311220-1
Inventor(s): Gary L. Vondran, Jr. et. al.
Title: "Methods and Systems for Processing Print Jobs"
Atty: Susan E. Heminger (650)236-2738

6/11

```
                    ┌─────────────┐
                    (    START    )
                    └──────┬──────┘
                           │
                           ▼
                 ┌───────────────────┐
                 │  IDENTIFY OBJECT  │──── 54
                 │   BOUNDING BOX    │
                 └─────────┬─────────┘
                           │
                           ▼
                 ┌───────────────────┐
                 │TRANSLATE OPERATION│
                 │COORDINATES RELATIVE│─── 56
                 │  TO BOUNDING BOX  │
                 └─────────┬─────────┘
                           │
                           ▼
                 ┌───────────────────┐
                 │ ROTATE OPERATION  │──── 57
                 │     SEQUENCE      │
                 └─────────┬─────────┘
                           │
                           ▼
                 ┌───────────────────┐
                 │   REVERSE LINE    │
                 │    CONNECTION     │──── 58
                 │     SEQUENCE      │
                 └─────────┬─────────┘
                           │
                           ▼
                 ┌───────────────────┐
                 │  USE TRANSFORMED  │
                 │     OBJECT TO     │──── 59
                 │ GENERATE SIGNATURE│
                 └───────────────────┘
```

FIG. 5

PDNO.: 200311220-1
Inventor(s): Gary L. Vondran, Jr. et. al.
Title: "Methods and Systems for Processing Print Jobs"
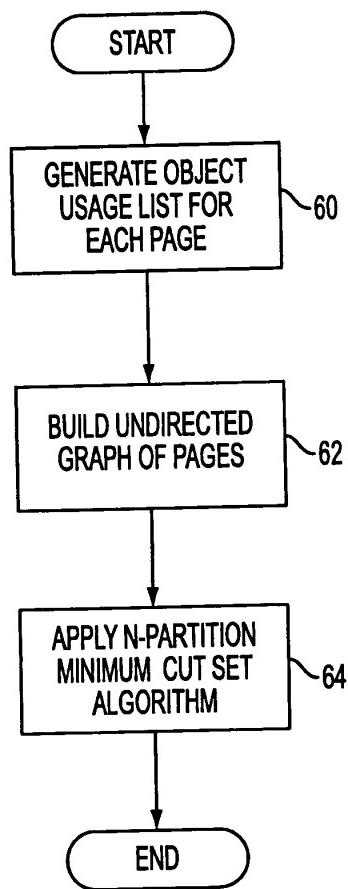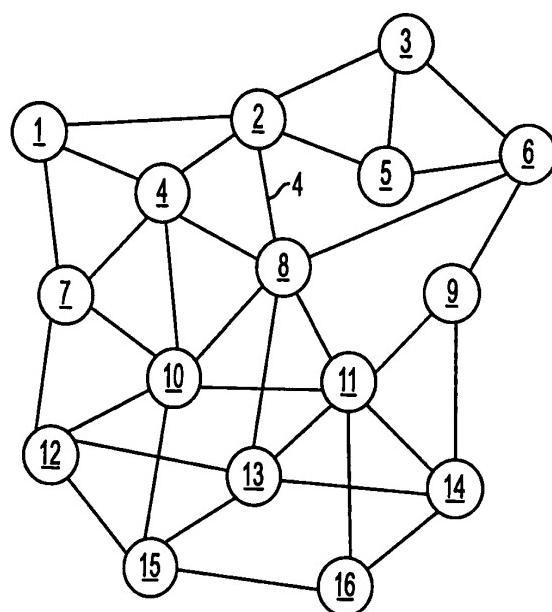Atty: Susan E. Heminger (650)236-2738

7/11

START

GENERATE OBJECT
USAGE LIST FOR
EACH PAGE — 60

BUILD UNDIRECTED
GRAPH OF PAGES — 62

APPLY N-PARTITION
MINIMUM CUT SET
ALGORITHM — 64

END

FIG. 6

PDNO.: 200311220-1
Inventor(s): Gary L. Vondran, Jr. et. al.
Title: "Methods and Systems for Processing Print Jobs"
Atty: Susan E. Heminger (650)236-2738
8/11

FIG. 7

PDNO.: 200311220-1
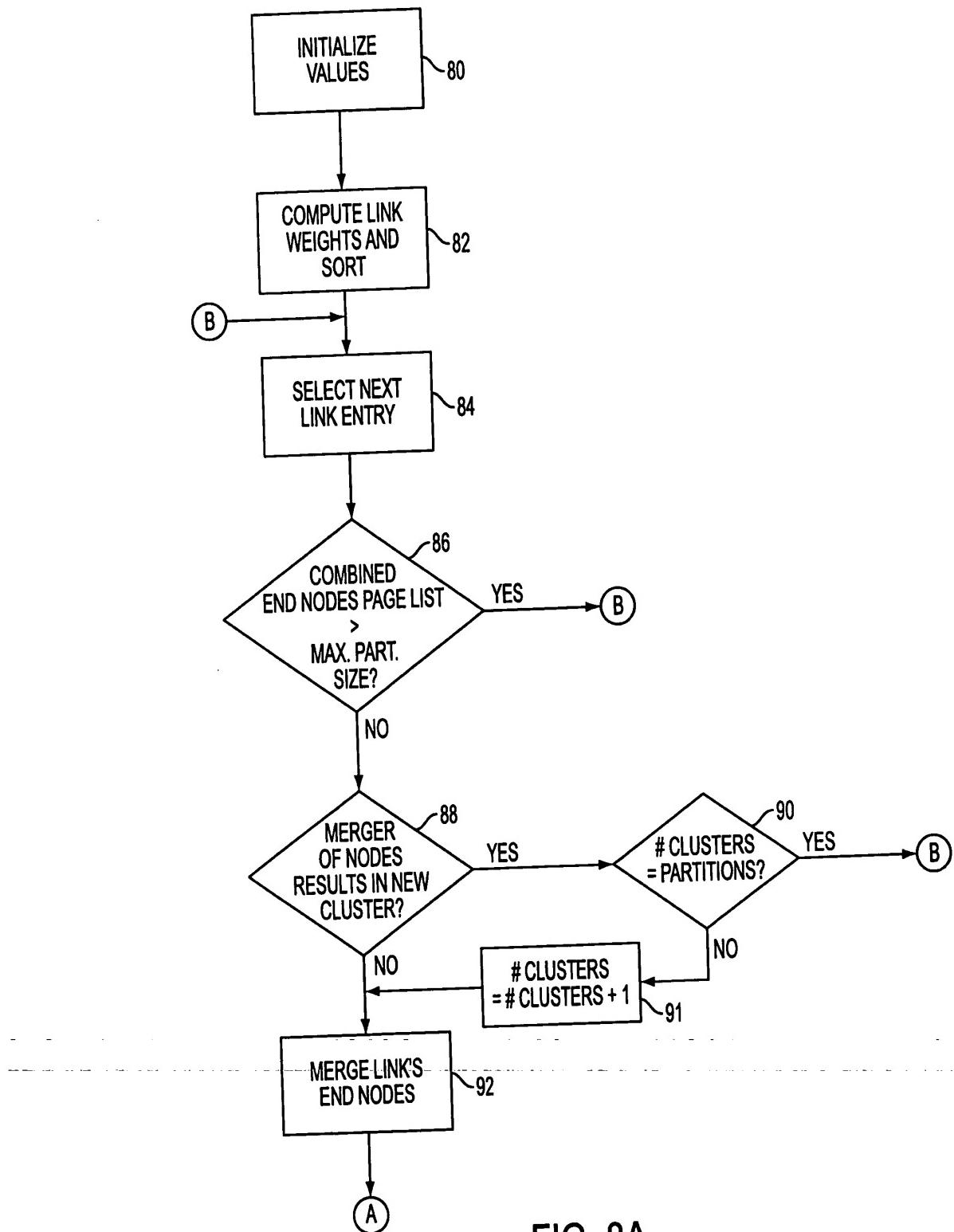Inventor(s): Gary L. Vondran, Jr. et. al.
Title: "Methods and Systems for Processing Print Jobs"
Atty: Susan E. Heminger (650)236-2738

9/11

INITIALIZE
VALUES — 80

COMPUTE LINK
WEIGHTS AND
SORT — 82

(B) →

SELECT NEXT
LINK ENTRY — 84

┌─ 86
COMBINED
END NODES PAGE LIST
>
MAX. PART.
SIZE? — YES → (B)

NO

MERGER
OF NODES — 88
RESULTS IN NEW
CLUSTER? — YES → # CLUSTERS — 90
= PARTITIONS? — YES → (B)

NO

NO

CLUSTERS
= # CLUSTERS + 1 — 91

MERGE LINK'S
END NODES — 92

(A)

FIG. 8A

PDNO.: 200311220-1
Inventor(s): Gary L. Vondran, Jr. et. al.
Title: "Methods and Systems for Processing Print Jobs"
Atty: Susan E. Heminger (650)236-2738
10/11

(A)

PAGES
IN MERGED NODE
=
MAX. PART.
SIZE? — 94

YES → MOVE MERGED NODE
TO COMPLETE
PARTITION LIST — 96

PARTITIONS =
PARTITIONS - 1 — 98

PAGES =
PAGES - MAX. PART.
SIZE — 100

CLUSTERS =
CLUSTERS - 1 — 102

MAX. PART. SIZE =
[PAGES / PARTITIONS] — 104

NO ↓

RECOMPUTE LINK
WEIGHTS — 106

RE-SORT
LIST — 108

PARTITIONS > 0? — 110   YES → (B)

NO ↓

END

FIG. 8B

PDNO.: 200311220-1
Inventor(s): Gary L. Vondran, Jr. et. al.
Title: "Methods and Systems for Processing Print Jobs"
Atty: Susan E. Heminger (650)236-2738

11/11

PDF FILE W/ EMBEDDED OBJECT
USAGE PROFILE

Usage Profile Object (Flate encoded form)

```
<PDF Header>

<PDF Body>

xref
´  `R
0000000000 65535 f
0000000019 00000 n
0000000480 00000 n
0000000503 00000 n
0000171680 00000 n
0000171714 00000 n
0000171733 00000 n
0000171883 00000 n
0000171902 00000 n
0000171994 00000 n
0000172143 00000 n
0000172163 00000 n
0000172314 00000 n
0000172334 00000 n
0000172427 00000 n
0000172579 00000 n
0000172670 00000 n
0000172724 00000 n
trailer
<<
<Size 18
<Root 16 0 R
<Info 1 0 R
<ID
[<2dfa5b50259373513075b4f
332ce2208><2dfa5b50259373
913075b4f332ce2208>]
>>
startxref

  EOF
```

```
17 0 obj
<< /Length 167 /Filter /FlateDecode >>
stream
xœÔ+OÊ
··NLO
(ÊOEÎIUˆæRª±QOT¨6ˆUªª_sŒ_¢
_Œˆä_u_RÊ1¢_'··
<a_Œ_ÂÁÂÀP_Ω+æp≠<´e`tf¨§>Ýtv¨
_-J
ª¯_6¬´&<F(ÍÀô__8__X@œ___~_Di3V'∞
XÁEµb___″_ª<+ f_b&S{″´´ØL_å
_@Ť__å€Š`__:_G@
endstream
endobj
```

Non-Compressed Object
Usage Profile Stream

```
/ObjUsageProfile<<
1 5
5[1 3 4 5 8]
3
3[3 4 5]
2[1 2]
7[2 2 4 4 6 6 6]
8 3
2[6 7]
2[6 7]
4[1 2 6 7]
13 5
4[1 2 2 2]
3[4 6 8]
1[0]
3[2 4 4]
1[9 9]
>>
```

Usage info for object 1
thru 5. Note object 2
does not include the
optional page list

Usage info for object 8
thru 10.

Usage info for object 13
thru 17. Note object 15
used prior to page 1 and
object 17 used after last
page (page 8).

FIG. 9